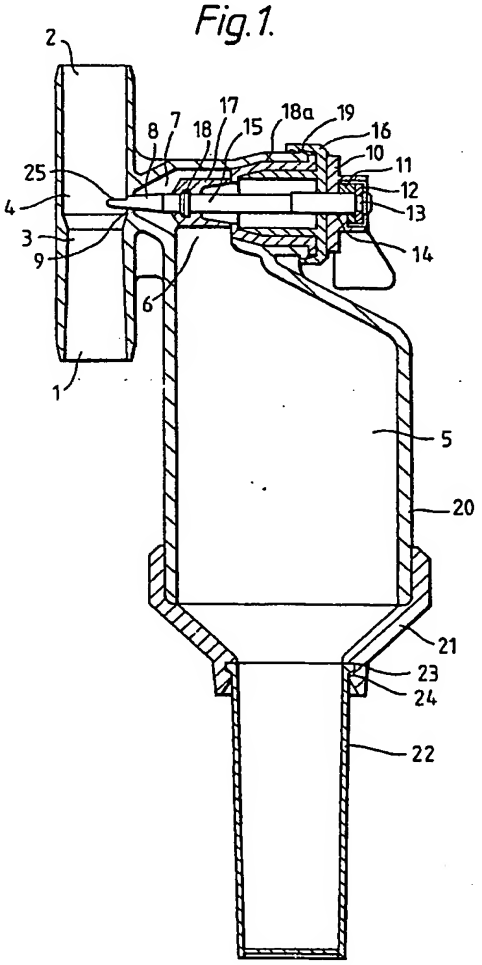
(12) UK Patent Application (19) GB (11) 2 107 282 A

(21) Application No 8226163
(22) Date of filing 14 Sep 1982
(30) Priority data
(31) 198359
(32) 15 Sep 1981
(33) New Zealand (NZ)
(43) Application published
27 Apr 1983
(51) INT CL³
G01N 1/10
(52) Domestic classification
B8N 12A2 TA
U1S 1019 B8N
(56) Documents cited
GB 0976688
GB A 2071846
(58) Field of search
B8N
(71) Applicant
Ahi Operations Limited,
(New Zealand),
640 Great South Road,
Manukau City,
Auckland,
New Zealand
(72) Inventor
Thomas Douglas Millar
(74) Agents
Boult, Wade and Tennant,
27 Furnival Street,
London,
EC4A 1PQ

(54) **Milk sampling device.**

(57) A milk samping device for a milking machine is fitted in a milk tube between a set of teat cups and a milk line of the milking machine. The device includes a passageway 4 through which air and entrained milk pass, and a chamber 5 of larger volume than the passageway and milk tube. The chamber 5 is connected to the passageway 4 by means of an orifice, which can be sealed by valve member 8, a conduit 6 and a chamber 7. A sampling vessel 22 is connected to chamber 5 by means of a tapered rubber sleeve 21. The pulsating flow of milk and air causes variations of pressure as between the passageway and the chamber resulting in a lower pressure in the chamber which draws a sample of milk into this chamber and thence into the sampling vessel.

Fig.1.



GB 2 107 282 A

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

Fig.1.

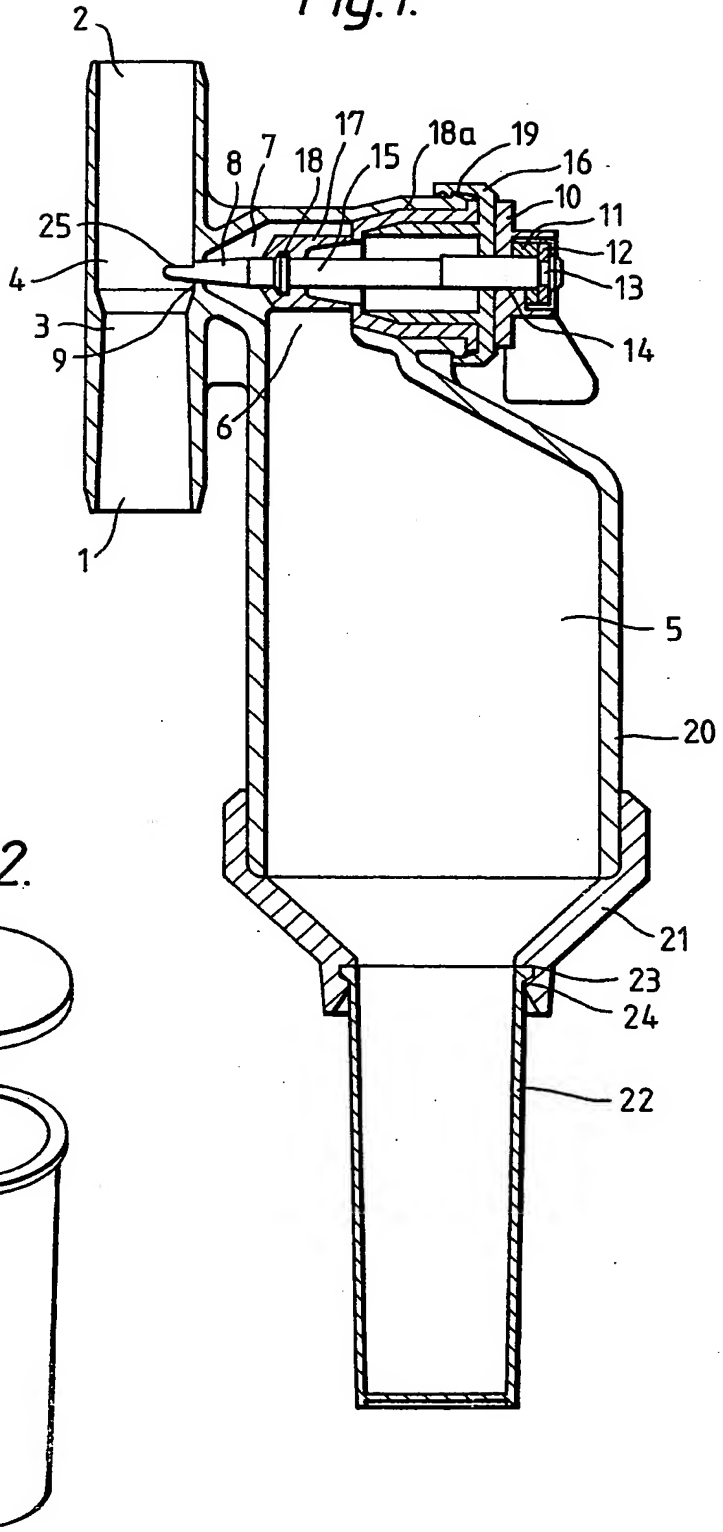


Fig.2.

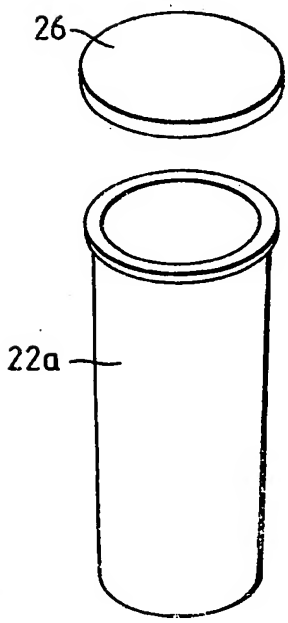
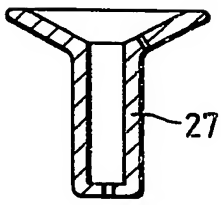


Fig.3.



SPECIFICATION

Milk sampling device

This invention relates to milk sampling devices and/or methods of operating the same.

It is an object of the present invention to provide a milk sampling device which will at least provide the public with a useful choice.

Accordingly in one aspect the invention consists in a method of sampling milk passing through a milk tube between a milking cluster and a milk line in a manner such that the pressure in the milk tube varies during milking in a pulsating manner, said method comprising the steps of passing a mixture of air and entrained milk through a passageway in said milk tube and drawing off from said passageway a proportion of said mixture of air and milk through a restricted orifice into a chamber of greater volume relative to the volume of said passageway and adjacent parts of said milk tube, by use of the pulsating variation in pressure between the pressure in said passageway and the pressure in said chamber resulting in the pressure in said chamber being lower than that in the passageway, the amount of milk drawn off being a representative sample of the milk flowing through slad passageway and collecting the sample of milk in a sample vessel.

In a further aspect the invention consists in a milk sampling device which in use is fitted in a milk tube between a milking cluster and a milk line of a milking machine, said device comprising a passageway, a sampling opening leading from said passageway, said sampling opening leading to a large chamber of large volume relative to the volume of said passageway and adjacent parts of said milk tube associated therewith in use, and a removable sampling flask associated with said large chamber the construction and arrangement being such that in use on said passageway being connected in said long milk tube between a milking cluster and the milk line of a milking machine and on a mixture of air and milk being passed through said passageway from the teat cups to the milk line, in a manner such that the pressure in said passageway varies in a pulsating manner, a sample of the milk will be extracted from the mixture by the pressure in the enlarged chamber being lower than the pressure in said passageway such lowering in pressure resulting from the milk entrained in the air reducing the pressure in said passageway as surges of milk occur during milking.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the scope of the invention as defined in the appended claims. The disclosures and the descriptions herein are purely illustrative and it is not our intention to limit the scope of the invention by those disclosures and descriptions, or otherwise, than by the terms of the appended claims.

One preferred form of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a cross-section of a sampling device according to the invention,

Figure 2 is a perspective sketch of a sampling flask and closure therefore, and

Figure 3 is a cross-section of a clean-in-place adaptor for use with the apparatus of figure 1.

Referring to the drawings a milk sampling device is provided for use in the flexible usually rubber tube known as the long milk tube which connects the milk pipes of a milking cluster to a milk line of a milking machine. During milking, due to the pulsator pulses applied through the teat cups to the animal, milk leaves the milking cluster in pulses or surges in a turbulent mixture of milk and air of varying densities and passes through the long milk tube on the way to the milk line of the milking installation. A milk sampling device according to the present invention is inserted into a break in this long milk tube so that the milk/air mixture enters a port 1 and exits through a port 2, these ports being connected by a passageway having a restricted section 3 and a chamber 4 of greater cross-sectional area than the cross-sectional area of the restricted section 3, which act to accelerate and compress or densify the milk/air mixture as it passes through restricted section 3 after which it will expand slightly on entering chamber 4. The action of restriction chamber 3 and enlargement 4 tends to equalise variations in density of the milk/air mixture in chamber 4 so that any portion of milk collected and/or removed from chamber 4 will be reasonably representative of the milk component of said mixture. The variations in cross-sectional area need not be great but in proportion for example as shown in the drawings.

A chamber 5 is provided in the body moulding 20 and having a volume which is large relative to the volume of the long milk tube in which parts 1 and 2 are mounted or at least parts thereof adjacent to the chamber 5.

Chamber 5 is connected to chamber 4 by conduit 6 chamber 7 and the gap or orifice between tapered valve member 8 and valve seat 9.

The gap between the valve member 8 and the valve seat 9 is opened and may be adjusted by the action of a lever 10 coacting with a cam surface 11 when the lever 10 is rotated with respect to a cap 16.

The cam 11 is mounted on a valve spindle 14 and retained thereon by a circlip 12 which fits into a groove 13 in the spindle 15. The spindle 15 has a flat surface at 14, parallel to the axis of spindle 15, so that the spindle will fit in a "D" shaped orifice in each of the cap 16 and the cam 11 to prevent the rotation of cam 11 and spindle 15 when the lever 10 is rotated to withdraw the valve member 8 on the spindle 15 from valve seat 9 against the effort exerted by a resiliently flexible (rubber or elastomer) seal 17.

The seal 17, is designed to apply a closing force to collar 18 on valve spindle 15, and fits

inside the body moulding 20 at 18a and is retained by cap 16 which snaps over protrusions 19 on the body or may be simply retained in use by external atmospheric pressure.

A flat surface 25 on one side, preferably downstream to the milk-flow of the outer end of valve member 8 provides an additional opening between valve member 8 and seat 9 when the spindle 15 is withdrawn to open the valve.

A tapered rubber sleeve 21 fits over the outside of the body moulding 20 and is provided with an annular rim 24 around an opening provided to receive and retain a top lip 23 of a sample flask 22.

The flask 22, which may be moulded of a suitable thermoplastic material such as polypropylene or polyethylene, may be readily changed after use by pulling it free of sleeve 21 and fitting a replacement.

A used flask 22a, figure 2, may be simply sealed by means of a closure 26 moulded from a material such as low density polyethylene. The closure 26 may be marked or labelled to identify the milk sample.

In operation the milking machine vacuum pump is started up, the teat cups are placed on a cow; and lever 10 operated to open valve member 8 from seat 9; the teat cups, claw, long milk tube and milk sampler are evacuated to say —50kPa.

As soon as milk starts to flow from the cow, the vacuum level in the claw will drop, (pressure will rise) say to —35kPa as the milk flow begins to congest and/or occlude the long milk tube and as atmospheric pressure continues to bleed in via the air admission hole (approx. 0.8 mm diameter) which is provided in standard milking claws.

When the milk flows up the long milk tube to the milk line, the vacuum level in the long milk tube will drop, or pressure will rise, in a similar manner to that described for the claw. However chamber 5 in the sampler body which is of a large volume relative to the long milk tube or at least parts of the long milk tube adjacent chamber 5 and is coupled to the long milk tube by means of the valve orifice between 8 and 9, has also been evacuated to —50kPa, and since the vacuum or pressure level in 5 will change slowly because of the restriction offered to air flow between 5 and 4 by said valve orifice, the vacuum level in chamber 5 will still remain close to —50 kPa when the vacuum level drops, or pressure rises in chamber 4 under the influence of the milk flow.

When this pressure differential exists, some air and entrained milk will flow from chamber 4, between valve member 8 and valve seat 9, through chamber 7 and conduit 6 to chamber 5 and will carry with it a small portion of the milk passing through chamber 4. The entrained milk will fall by gravity into the flask 22.

When the pulse or surge of milk reaches the milk line and the pulsation action on the teat cups has stopped or reduced milk flow from the cow's teats, the vacuum level in the claw, long milk tube chamber 5 and flask 22 of the milk sampler will again rise to —50 kPa so that the cycle will repeat with the next and succeeding surges of milk.

It will be seen that the sampler "sips" or extracts a small portion of each surge of milk passing through chamber 4 and the successive small portions are collected in the sample flask 22.

The proportion removed from the main flow may be adjusted by use of lever 10 to alter the position of valve member 8 and thus the orifice area between chamber 4 and chamber 5. To a lesser degree it may also be controlled by the volume of chamber 5 and flask 22 relative to the volume of space in chamber 4 and the long milk tube. Because the air space in flask 22 will change as it fills with milk it is desirable to have the volume of chamber 5 relatively large compared with that of flask 22.

By use of lever 10, the size of the sample collected may be adjusted to suit low or high yield cows and/or the requirements of the milk analyses.

The sample so collected will within acceptable limits be so a consistent representative proportion of all the milk passing through chamber 4.

For clean-in-place washing, sample flask 22 may be replaced by adaptor 27 (figure 3) which is connected to a supply of washing fluid. With valve member 8 fully retracted from valve seat 9, and the milking machine in operation, washing of all milk contact surfaces will be effected.

The invention also envisages a milking machine incorporating a device as above described and/or method of operating the same.

Claims

1. A method of sampling milk passing through a milk tube between a milking cluster and a milk line in a manner such that the pressure in the milk tube varies during milking in a pulsating manner, said method comprising the steps of passing a mixture of air and entrained milk through a passageway in said milk tube and drawing off from said passageway a proportion of said mixture of air and milk through a restricted orifice into a chamber of greater volume relative to the volume of said passageway and adjacent parts of said milk tube, by use of the pulsating variation in pressure between the pressure in said passageway and the pressure in said chamber resulting in the pressure in said chamber being lower than that in the passageway, the amount of milk drawn off being a representative sample of the milk flowing through said passageway, and collecting the sample of milk in a sampling vessel.

2. A method as claimed in claim 1 which includes the steps of passing said mixture of milk and air through an upstream section of restricted area followed by a section of enlarged cross-sectional area from which latter area said sample is drawn off.

3. A method as claimed in claim 1 or claim 2 which includes the steps of adjusting the size of said orifice according to an estimation of milk

yield so that successive samples are of about the same volume even though the total milk yields vary.

4. A method of sampling milk when effected substantially as herein described with reference to and as illustrated by the accompanying drawings.

5. A milk sampling device which in use is fitted in a milk tube between a milking cluster and a milk line of a milking machine, said device comprising a passageway, a sampling opening leading from said passageway, said sampling opening leading to a large chamber of large volume relative to the volume of said passageway and said milk tube associated therewith in use, and a removable sampling flask associated with said large chamber the construction and arrangement being such that in use on said passageway being connected in said long milk tube between a milking cluster and the milk line of a milking machine and on a mixture of air and milk being passed through said passageway from the teat cups to the milk line, in a manner such that the pressure in said passageway varies in a pulsating manner, a sample of the milk will be extracted from the mixture by the pressure in the enlarged chamber being lower than the pressure in said passageway such lowering in pressure resulting from the milk entrained in the air reducing the pressure in said passageway as surges of milk occur during milking.

6. A milk sampling device as claimed in claim 5 wherein said passageway includes an upstream section of restricted cross-sectional area followed by a downstream section of enlarged cross-sectional area.

7. A milk sampling device as claimed in claim 5 or claim 6 wherein said apparatus includes adjustable means manually operable to adjust the size of the sampling orifice and accordingly the relative size of the sample collected relative to the volume of milk passing through the passageway.

8. A milk sampling device as claimed in claim 7 wherein said adjusting means comprise a tapered valve member fitting in a valve orifice, said tapered valve member being adjustable axially to cause adjustment of the size of the sampling orifice.

9. A milk sampling device as claimed in claim 8 wherein said axial adjustment of said valve member is effected by rotating a cam surface relative to a fixed member to move said valve member axially.

10. A milk sampling device as claimed in claim 8 or claim 9 wherein said valve member has a flattened surface on the downstream side thereof.

11. A milk sampling device when constructed arranged and operable substantially as herein described with reference to and as illustrated by the accompanying drawings.

12. A milking machine having fitted in a milk tube between a set of teat cups and a milk line thereof a milk sampling device according to any one of claims 5 to 11 hereof.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1983. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained